Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of Faurecia Clarion Electronics North America Petition For Declaratory Ruling And Request For Waiver of Section 15.255(c)(3) of the Commission's Rules For Interactive Motion Sensing Devices	ET Docket No. _____

PETITION FOR DECLARATORY RULING AND REQUEST FOR WAIVER OF SECTION 15.255(C)(3)

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TABLE OF CONTENTS

I. INTRODUCTION AND SUMMARY

Faurecia Clarion Electronics North America ("Faurecia") hereby submits this Petition for a Declaratory Relief And Request For Waiver to the Federal Communications Commission ("Commission") in connection with its in-cabin automotive sensor ("Sensor") that uses millimeter wave ("mmwave") technology and is designed to operate within the 57-64 GHz band. Faurecia's Sensor will perform various safety functions and is designed to detect human occupants and human movements within a vehicle and the Sensor is able to classify vehicle occupants. This Sensor enables in-vehicle safety applications such as detecting children left behind in hot cars, monitoring vital signs of drivers, detecting seat occupancy for passenger safety applications, and detecting intrusion into vehicles. Potentially, this Sensor also could be used to allow the driver or a front seat passenger to activate in-cabin lighting or heating through hand gestures.

It is Faurecia's position that all of these uses are allowed under Section 15.255(a)(2) of the Commission's rules, and Faurecia is requesting a declaratory ruling confirming this point. If, however, the Commission believes a particular use is not permissible under the rules, Faurecia is requesting a waiver of the rule with respect to any such use, and Faurecia is confident that it has met the Commission's waiver standards. This Petition identifies numerous uses or functions that are of interest to Faurecia's customers, which are vehicle manufacturers. If necessary, these uses can be considered individually, and Faurecia urges the Commission to grant the requested relief on as many uses as possible. This is not an "all or nothing" request by Faurecia. The Commission is free to grant relief on a use-by-use basis, as appropriate.

Separately, while Faurecia believes that it may not have to exceed the power levels set forth in Section 15.255(c)(3) of the Commission's rules, out of an abundance of

caution, Faurecia is seeking a waiver with respect to that portion of the rule in the event such limits must be exceeded in order to meet reliability requirements and satisfy Faurecia's customers' requirements. This waiver would allow Faurecia's Sensor to operate in the same footprint allowed by the Commission for Google's Soli device.[1]

In sum, this Petition presents three requests for relief. First, Faurecia requests that the Commission issue a declaratory ruling stating that each of the Sensor's uses as outlined below are permissible under Part 15 rules, specifically under 47 CFR § 15.255(a)(2). Second, Faurecia requests, in the alternative, that if the Commission does not agree that a particular listed use is permissible, that the Commission waive Section 15.255(a)(2) to allow the Sensor to operate in the 57-64 GHz band. Third, independent of the relief requested above, Faurecia requests a waiver of the power limits established in 47 CFR 15.255(c)(3), just in case the limits must be exceeded in order for the Sensor to function reliably and consistently and meet customer specifications.

The public interest would be served by allowing consumers to obtain the safety and security benefits offered by the Sensor. Thus, good cause exists to grant the relief requested herein.[2]

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[1] *See Google LLC Request for Waiver of Section 15.255(c)(3) of the Commission's Rules Applicable To Radars Used for Short-Range Interactive Motion Sensing in the 57-64 GHz Frequency Band*, Order, 33 FCC Rcd 12542 (OET 2018) ("Google Waiver Order").

[2] Several other manufacturers, including Brose North America, Inc., Tesla, Inc., Infineon Technologies Americas Corp., Valeo North America, Inc., and Vayyar Imaging Ltd., have submitted similar, if not identical requests. *See, e.g.,* Tesla, Inc. Request for Waiver of Section 15.255(c)(3), ET Dkt. No. 20-264 (July 31, 2020) ("Tesla Waiver"); Infineon Technologies Americas Corp. Request for Waiver, ET Dkt. No. 20-263 (July 23, 2020) ("Infineon Waiver"); Valeo North America, Inc. Request for Waiver of Section 15.255(c)(3) of the Commission's Rules for Short Range Interactive Motion Sensing Devices, ET Dkt. No. 20-121 (March 31, 2020) ("Valeo Waiver"); Vayyar Imaging Ltd., Request for Waiver of Section 15.255(c)(3) of the Commission's Rules for Interactive Motion Sensing Devices, ET Dkt. No. 20-15 (Nov. 13, 2019). To our knowledge, the Commission has not yet acted on any of these requests. As these

II. BACKGROUND

A. Overview of Faurecia Clarion Electronics North America

Faurecia Clarion Electronics North America, with its headquarters in Auburn Hills, Michigan, supports one of four business groups of Faurecia, one of the world's leading automotive technology companies. Faurecia Clarion Electronics is a key player leading the automotive industry; the company develops new and cutting-edge technologies based on advanced cockpit electronics and advanced driver assistance systems. The company is engaged in the research, engineering, marketing and sales of audio, entertainment, navigation, and in-vehicle information solutions. The company also specializes in cloud connectivity and intelligent safety solutions for the automotive, recreational vehicle, commercial fleet and heavy industry environments.

As a top tier OEM partner to many automakers, Faurecia has received numerous awards for design, innovation, support, manufacturing and product reliability. Faurecia's mission is to bring advanced technologies and innovative high-quality products and solutions to users in order to help them enhance their quality of life through increased productivity, better entertainment, improved safety, and access to always-on cloud-based systems.

B. Description of the Subject Device

The Sensor is a millimeter wave radar sensor that operates in the 60-64 GHz band. Presently, it is expected to have a maximum conducted power of -10 dBm, a maximum EIRP of +10 dBm and will operate with a maximum duty cycle of 10%. It will comply with the Commission's radiofrequency radiation exposure limits with a power density lower than

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entities have indicated, the comments relating to these requests have generally been very supportive or enthusiastic. The commenting parties have recognized the benefits offered by these devices and have not identified any increased risk of interference that would be caused by the limited increase in power levels typically requested.

1mw/cm² per 30 minutes. The emission code is F3N, and the frequency tolerance is 100ppm (2%). The Sensor will utilize Multiple Input Multiple Output (MIMO) antennas, driven by a highly configurable FMCW transceiver with a 4-GHz continuous bandwidth.

The Sensor will be mounted inside the cabin of the vehicle. The Sensor is designed to cover the inside cabin area with a maximum field of view of ± 85° for both azimuth and elevation angles. In-vehicle radar modulation will consist of consecutive frames, including an acquisition sequence comprised by a repetition of frequency chirps or stepped chirps, a listening period, then a signal processing. The acquisition sequence is followed by idle time where antennas are not transmitting. The frequency chirps will span over a 5GHz bandwidth within the 57-64 GHz band and the duty cycle is designed to comply with the FCC power density limit by cycling between processing, scanning, and idle state.

This Sensor could potentially have at least three difference uses. First, this Sensor will be designed to detect children left behind inside the vehicle's cabin. This includes detecting children in conditions where their presence is difficult to detect in a traditional way, such as a young child hiding in the vehicle footwell area or a young child covered with a blanket and sleeping. This feature would be activated when the vehicle is parked.

Second, this Sensor could be used to detect driver or front seat occupant gestures, whereby a person's hand controls specific in-cabin features. The hand gestures could control lighting or heating or temperature control inside the vehicle. Similar to the first use, this feature would be activated when the vehicle is parked.

Third, this Sensor could detect unwanted intrusion in the vehicle while the vehicle is parked. The Sensor is able to detect the presence of a human intruder. It could enable the vehicle to send a text message to the driver or vehicle owner indicating that there is a person entering the vehicle or already inside the vehicle.

With respect to the first use, in-vehicle radar sensing is well-suited to address the risk of heatstroke in children inadvertently left in hot cars. According to the National Highway Traffic Safety Administration, more than 50 children died from vehicular heatstroke in both 2018 and 2019, the majority of which had been left in the vehicle because someone forgot the child was there.[3] Faurecia's mmwave radar technology can detect a child left behind in a vehicle and has some advantages over other sensing systems, including camera-based systems or in-seat occupant detection systems Unlike cameras, mmwave provides depth perception and can "see" through soft materials, such as a blanket covering a child in a child restraint. Furthermore, mmwave can differentiate between a child and an object left on the seat, reducing the likelihood of false alarms, and mmwave is capable of detecting micro-movements like breathing patterns and heart rates.[4]

With respect to the second potential use, the Sensor can detect driver or front seat passenger gestures. The Sensor may be used to detect intentional gestures that can control vehicular occupant comforts, such as lighting or heat control, but also may provide safety benefits by detecting movements that might indicate that an occupant is having a heart attack or a medical emergency.

This Sensor could also be used for vital signs monitoring. The Sensor can be configured to identify changes in breathing that may indicate that the driver either is on the verge

[3] See: Hot Car Deaths: Record Number of Children Have Died | NHTSA.

[4] With the Sensor in place, the driver or the registered vehicle owner could receive a text message or messages whenever a child is left behind in the vehicle. This reminder or series of reminders could encourage the vehicle owner or the driver to return to the vehicle and attend to the child.

of falling asleep or is experiencing a medical condition that affects respiration. Here again, the system could be designed to send an appropriate warning to the driver.[5]

The third potential use of this Sensor also involves detection of individuals or intruders inside the vehicle. Instead of monitoring for the presence of children left behind or monitoring the vital signs of the driver, this third function may detect the presence of unauthorized persons entering the vehicle or moving inside the vehicle. Essentially, by detecting intrusion into the vehicle, the Sensor could enhance the safety for the vehicle owner or driver because the driver and/or the registered owner could receive a text message warning of the presence of an intruder in the vehicle. This would allow the recipient of the text message to take appropriate precautions before attempting to re-enter the vehicle.

III. REQUESTED RELIEF

A. Faurecia Requests That The Commission Issue A Declaratory Order Confirming That Its Sensor Qualifies as a Short-Range Interactive Motion Sensing Device Under Section 15.255(a)(2)

Faurecia takes the position that its Sensor, which uses mmwave technology and operates in the 57-64 GHZ band, qualifies as a short-range interactive motion sensing device under Section 15.255(a)(2) of the Commission's Rules.[6]

[5] Potentially, this Sensor could also provide information that would be useful in connection with the vehicle's air bag system. The Sensor could differentiate between a person and an object inside the vehicle, thereby avoiding activation of the air bag when an object is present. Likewise, the Sensor could potentially differentiate between a full size adult and a small child or infant. This information would be useful in avoiding air bag activation where the air bag could create injuries to a child or infant.

[6] *See* 47 C.F.R. § 15.255(a)(2) (prohibiting use of field disturbance sensors in the 57-71 GHz band "unless the field disturbance sensors are employed for fixed operation, or used as short-range devices for interactive motion sensing").

Section 15.255(a)(2) of the Commission's Rules permits operation in the 57-71 GHz band by "field disturbance sensors [that] are employed for fixed operation, or used as short-range devices for interactive motion sensing."[7] As explained previously, Faurecia's Sensor will operate in a contiguous 5 GHz band within the 57-64 GHz band. The applicable Spectrum Frontiers Order adopting Section 15.255 does not define "short-range devices for interactive motion sensing," but offers an example. It states that "short-range devices for interactive motion sensing, such as that described in Google's Project Soli – where a radar is used to detect hand gestures very close to a device to control the device without touching it – could be allowed without causing harmful interference to other authorized users." (*Spectrum Bands above 24 GHz for Mobile Radio Services*, 31 FCC Rcd 8014 at ¶ 337 (2016).) That description was merely illustrative, not exhaustive, as indicated by the non-exclusive qualifier "such as." Additionally, the plain meaning of "short-range" includes those devices that are "only able to be used or be effective over short distances."[8]

Faurecia's Sensor will be limited to in-cabin sensing and therefore will, by definition, be short-range. The Sensor may include automotive gesture recognition applications, and senses both intentional and unintentional gestures of people, and movement of animals, within a vehicle cabin to perform various safety functions as discussed herein. Without any additional transmissions than those that would be used to sense intentional hand gestures, the Sensor will interact with human and animal passengers in vehicles by sensing their motion to activate various safety features.

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[7] *Id.*

[8] See: https://www.lexico.com/en/definition/short-range.

With respect to what can be considered "interactive motion sensing," Faurecia believes that all of the Sensor's potential uses are "interactive." The Oxford English and Spanish Dictionary defines "interactive" as "(of two people or things) influencing each other" and "(a)llowing a two-way flow of information between a computer and a computer-user; responding to a user's input."[9] Faurecia agrees with Tesla[10] and Brose[11] that a device is "interactive" when a person will interact with – and influence – the device through movements within the vehicle (including micro-movements like respiration and larger movements such as intrusion) and that interaction constitutes "interactive motion sensing." Faurecia also agrees with Valeo that the Merriam-Webster definition of "interaction" can be based on occupancy or vacancy of space and the characteristics of the occupants.[12]

Faurecia maintains that the Sensor's use as a child detection device falls squarely within what is meant by "interactive motion sensing," as a child passenger's movements interact with the device (whether intentional or not), and influence the device. When the Sensor is triggered, a text message could be sent to the vehicle's driver or owner indicating that movement has been detected. This logic similarly applies to the Sensor's second use of detecting driver or front seat passenger gestures, including detection of intentional gestures that can control vehicular occupant comforts, and also detection of unintentional movements that might indicate a heart attack or other medical emergency.

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[9] https://www.lexico.com/definition/interactive (last accessed January 13, 2021).

[10] *See Tesla Waiver* at 10.

[11] *See Brose North America, Inc. Request for Waiver of 47 C.F.R. § 15.255(c)(3) for Short Range Interactive Motion Sensing Devices in Vehicles*, at page 3, Ft. 3 (November 25, 2020).

[12] *See Valeo Waiver* at 4.

So, while the term "interactive" certainly encompasses intentional interactions between the vehicle occupants and the Sensor, it also is broad enough to encompass situations where people or things influence or have an effect on each other, regardless of whether a person is intentionally "using" the device.[13] Faurecia believes that the term is broad enough to encompass the Sensor's third potential use, namely, use as an intrusion detection device. The Sensor ultimately triggers a warning to the driver or vehicle owner, which itself is an interactive event. As noted by the Alliance for Automotive Innovations, enhanced vehicle security is one of the valuable safety benefits offered by in-vehicle sensing technology applications such as Faurecia's Sensor.[14]

Thus, this Sensor will function as a short-range device for interactive motion sensing under Section 15.255(a)(2).

Faurecia requests that the Commission issue a declaratory ruling, pursuant to 47 CFR §1.2, stating that each of the three uses outlined above are permissible under Section 15.255(a)(2), assuming the Sensor can operate within the applicable Part 15 power limits. To be clear, Faurecia takes the position that each of its requested uses are severable and can be considered individually by the Commission. As such, Faurecia requests that the Commission evaluate each use separately and not automatically deny Faurecia's request for relief in full if, for example, the Commission believes that one or two of the uses are permissible, but not all three.

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[13] Interactive | Definition of Interactive by Oxford Dictionary on Lexico.com also meaning of Interactive (last accessed January 13, 2021).

[14] The Alliance for Automotive Innovations has filed comments on the pending waiver requests, stating that "achieving the full potential of millimeter wave radar technology for in-vehicle sensing applications will serve the public interests of improved safety, reduced injuries, and enhanced vehicle security." Alliance of Automotive Innovators, Comments, ET Dkt. No. 20-264 at 2 (Sept. 21, 2020).

B. As An Alternative To The Relief Requested in III.A., If The Commission Finds That Any Of The Proposed Uses For This Sensor Do Not Qualify As Interactive Motion Sensing Functions, Faurecia Requests A Waiver of Section 15.255(a)(2)

In the alternative, to the extent the Commission believes that one, two, or all of Faurecia's Sensor uses are currently prohibited by the Part 15 rules, Faurecia requests that the Commission waive the requirements of Section 15.255(a)(2) to allow the Sensor to operate in the 57-64 GHz band for each use for which the Commission determines a waiver is necessary.

The Commission's Rules may be waived for good cause.[15] A waiver is appropriate where the particular facts would make strict compliance inconsistent with the public interest.[16] The Commission may grant a waiver of its Rules where the requested relief would not undermine the policy objective of the rule in question, special circumstances warrant a deviation from the general rule, and such deviation will serve the public interest.[17]

Faurecia requests that the Commission grant a waiver of Section 15.255(a)(2) with respect to any of the Sensor's uses to the extent it believes a particular use is prohibited by the existing rule. Issuance of a waiver is warranted because the Sensor will assist vehicle manufacturers in their ongoing efforts to ensure the safety of drivers and passengers; the Sensor will enhance safety by using short-range radar operating between 57-64 GHz. As explained above, every year, there are deaths and injuries that could be avoided through the use of in-cabin Sensors. This includes children tragically overheating in a parked hot car, passengers suffering

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[15] 47 C.F.R. § 1.3.

[16] *See AT&T Wireless Services, Inc. et al. v. FCC*, No. 00-1304 (D.C. Cir. 2001), *citing Northeast Cellular Tel. Co. v. FCC*, 897 F.2d 1164, 1166 (D.C. Cir. 1990).

[17] *See generally, WAIT Radio v. FCC,* 418 F.2d 1153 (D.C. Cir. 1969)*, cert. denied,* 409 U.S. 1027 (1972)*; see also Northeast Cellular*, 897 F.2d at 1166.

serious injury due to air bag malfunctions or to an unfastened seat belt in a crash, or a driver having a heart attack in the middle of busy traffic. With radar-based sensing technology using the 57-64 GHz band, innovative applications can be developed for reducing deaths and injuries by providing timely warnings regarding children or animals left in a parked vehicle, driver vital signs, passenger seat belt reminders, and proper airbag deployment decisions based on passenger size. Additionally, the security intrusion function of the Sensor protects the vehicle's occupants, as well as the public as a whole.

To the extent the Commission believes that a particular Sensor use is not permitted under the rules, strict compliance with Section 15.255(a)(2) would be inconsistent with the public interest, because the benefits of this technology are significant. Additionally, the waiver would not undermine the policy objective of the rule, which is to allow the use of interactive motion sensors while avoiding or minimizing the potential for harmful interference within the 57-64 GHz band.

For all of these reasons, Faurecia has shown good cause for any waiver of Section 15.255(a)(2) that might be necessary. If the Commission were to grant a waiver for the Sensor, this waiver would enable Faurecia to provide the automotive industry with various safety-focused sensing features that will serve the public interest.

C. Independent of the Relief Requested Above, Faurecia Requests a Waiver of the Power Limits Set Forth in Section 15.255(c)(3), In The Event Additional Power Is Needed For The Sensor To Properly Function and Meet Customer Requirements

As explained above, Faurecia's Sensor will operate in a contiguous 5 GHz band within the 57-64 GHz band. Faurecia believes that the Sensor may be able to fully and properly operate within the power limits established in the Commission's Rules at 47 CFR 15.255(c)(3). However, out of an abundance of caution, and independent of the relief requested in III.A. and

III.B. herein, Faurecia requests that the Commission grant a waiver of the power limits within Section 15.255(c)(3). While Faurecia currently expects the Sensor to be compliant with the power limits in that rule, the company seeks to ensure it can meet customer demands if it ultimately is determined that the power limits must be exceeded for the Sensor to function reliably and as intended.

Section 15.255(c)(3) limits the power range at which the Sensor may be operated in the 60 GHz band. For short range devices for interactive motion sensing, "the peak transmitter conducted output power shall not exceed -10 dBm and the peak EIRP level shall not exceed 10 dBm."[18] This power level restriction was part of the spectrum control developed to facilitate co-existence of all unlicensed 60 GHz devices in the 57-64 GHz band, and was incorporated into the Commission's rules in 1998.

As explained above, Faurecia is seeking a waiver for the purpose of occupying the same footprint approved by the Commission for Google's Soli sensor. (*See* Google Waiver Order ¶¶ 5, 12, and 14.) The Commission granted Google's request on the following basis: limited power levels at +10 dBm conducted power, +13 dBm EIRP, and +13 dBan/MHz spectral power density, and compliance with a maximum 10% duty cycle (transmissions no longer than 3.3 ms in any 3.3 ms time period). In granting this relief, the Commission found that the Soli sensor would pose minimal risk of harmful interference to other spectrum users. Additionally, the Commission found that the waiver would serve the public interest by providing for innovative device control features of interest to disabled users and others. (*Id*.)

Much of the same logic applies here. If anything, the interference risks are even lower because the Faurecia Sensor would only be used inside a vehicle. Additionally, the Sensor

[18] 47 CFR § 15.255(c)(3).

is pointed downward in the vehicle, lessening the potential for any significant transmission of radio waves outside the vehicle.

Here, good cause exists to grant Faurecia's waiver request. If it turns out that Faurecia needs higher power levels than allowed under the rules, the public interest would not be served by strict compliance with the rule. Certainly, the requested waiver would not undermine the purpose of the rule, which is to allow use of motion sensors while reducing the potential for harmful interference within the GHz band.[19] The evidence indicates that the Sensor used in passenger cabins as contemplated herein will not conflict in any way with other in-vehicle systems.

With respect to potential interference to other 60 GHz devices or systems outside a vehicle cabin, there are no plausible interference concerns from operation of the in-cabin Sensor at higher power levels for the following reasons:

> - The vehicle body acts as a natural shield to the already low-power 60 GHz signals. The Sensor's power level, even if slightly above the limits in Section 15.255(c)(3), is not strong enough to detect anything beyond approximately 2 meters of the perimeter of the vehicle.
>
> - The carrier frequencies of ~60 GHz ensure a high free space path loss of 68 dB/m leading to a strong signal power reduction over very short distances on the same scale as the vehicle itself.
>
> -At 60 GHz there is peak oxygen absorption that further reduces radar transmitter signal power propagation.
>
> -Different mitigation techniques can be used to reduce the probability of interference.

This in-cabin Sensor would operate at powers limited to cover only the interior of the vehicles, and use of this Sensor is extremely unlikely to cause any interference to external

[19] *Spectrum Frontiers* Order at ¶ 334, n. 913.

systems. Moreover, because the in-vehicle systems utilizing the Sensor would be at ground level, within cabins, the potential for interference to satellite systems is virtually non-existent. Consequently, Faurecia submits that if the Commission grants the waiver, the Commission's action will facilitate the contemplated passenger safety innovations and technological advancements for in-cabin vehicular applications without increasing the potential for interference with other systems. A grant of the requested waiver would not undermine the purpose of the rule.

The benefits of this technology are significant and, if needed, a deviation from the rules is in the public interest. As explained above, this Sensor has the potential to save lives, reduce injuries, and provide enhanced security. Strict compliance with the stated power levels, on the other hand, could potentially make it difficult, if not impossible, for this technology to reach its full potential.

IV. CONCLUSION

Faurecia respectfully requests that the Commission grant the relief requested herein. Faurecia's Sensor will provide a multitude of safety benefits to drivers and vehicle occupants, including infants and small children. These benefits will be obtained without causing harmful interference to other spectrum users. Accordingly, the Commission should either grant a declaratory order confirming that the proposed uses are permissible under the existing rule or should waive any requirements in the rule that would block particular uses of this in-cabin Sensor. Separately, the Commission should grant a waiver that allows Faurecia to exceed the existing power limits, if necessary. Since this Sensor offers substantial safety benefits and since strict compliance with power limits in the existing rule would potentially limit the reliability and effectiveness of the Sensor, there is good cause to grant this waiver request.

Respectfully submitted,

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